Corruption in Open-Source Software Organisations: A Theoretical Framework

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Abstract:

This article analyses the corruption phenomenon in Open Source Software Organizations using a deductive approach. For that purpose, we examine whether there may be corruption motives in such organizations which are not based on the profit motive and give advice how corruption should be dealt with. Our findings demonstrate that although in Open Source Software Organizations there is no intent to realize a profit, corrupt practices may occur nonetheless and should be combated. Criteria of efficiency for the assessment of the different anti-corruption instruments are that they prohibit corruption ex-ante and that no instrument influences the motivation in a negative way. Assigning the types of people joining the open source community on Frey / Osterloh's motivation types makes an examination of the effects of the instruments possible and shows that only intrinsic instruments are suited to fight corruption in Open Source Software Organizations in an effective way.

Keywords: Open Source Software; corruption; instruments; motivation; motives; theoretical.

Introduction

Corruption is a very ancient phenomenon (Finley, 1983). As the corruption phenomenon itself, the field of research has also come of age and maturity (Jain, 2001). Up to the nineties, corruption has only been discussed and analysed theoretically. The resulting findings were not clear and not generally accepted. It was in 1995 that Paolo Mauro started empirical corruption

research (Frank, 2004). He began researching on the consequences of corruption and was the first to confirm the negative macroeconomic and social consequences of corruption by establishing international longitudinal studies. This was a milestone in the field of corruption research.

Similar to Mauro, a lot of economists only refer to the public sector in their definitions of corruption. They view corruption as "[…] misuse of public office for private gain" (Svensson, 2005:20; Golden et al., 2005:38), "[…] acts in which the power of public office is used for personal gain in a manner that contravenes the rules of the game" (Jain, 2001:73) or "[…] (illegal) selling of a public entity's […] property or services for gain (bribe) to the seller (not to the public entity)" (Vinod, 1999:592). By doing this, possible corrupt activities which only appear between actors of the private sector are neglected. However, at least since the worldwide known corruption scandals of Enron and WorldCom at the beginning of the 21st century, it has to be assumed that such definitions are incomplete. Because of this, now also broader oriented definitions, such as "the abuse of power for personal gain" (Yu, 2005:148) or "[…] corruption can occur in both the public and private domains" (Hodgson et al., 2007:1044) in which as well the public and the private component is included can be found.

Today it is generally agreed that corruption can appear in multiple sectors and its presence cannot be limited to the public and private sector. Ashforth et al. consider corruption as omnipresent (Ashforth et al., 2008). It can be found in for-profit, non-profit and public organizations (Senior, 2004). Even organizations in which one would not expect corrupt practices have to face this problem (Ashforth et al., 2008). However, what is noticeable is the fact that corruption is not analysed in the area of Open Source (Software), in which the profit motive is absent. An intensive search in the existing scientific databases has not given any result.

Hence, it can be argued that there have not been done any significant investigations in this area yet. However, we hold that this would make sense and is a justifiable undertaking due to the fact that an interesting case is that the major competitor of the worldwide leading software producer comes exactly from the Open Source sector (Lindner, 2003) and is an Open Source Software Organization (OSSO). Under the presumption that one primary effect of corruption is increase in sales and market power (Wu, 2005) and that according to Rodriguez et al. corruption exists in every area (Rodriguez et al., 2005), hence also in OSSOs, the possibility that the OSSO has procured a competitive advantage applying corrupt practices has to be considered. We argue that in addition to typical corruption motives which primarily have a commercial origin (Pfarrer et al., 2008; Pinto et al., 2008) such as “pressure to success”, “pressure to create turnover”, “performance-based remunerations” etc. there may also exist non-commercial motives which make this topic relevant for OSSOs. Research question of this paper is therefore under which conditions corruption also appears in OSSOs and if so, how management can effectively combat this phenomenon. Aim of this paper is to create a theoretical contribution to Open Source research and to close the identified research gap as well as to give effective recommendations how to fight the corruption phenomenon in OSSOs.

Methodology

Our article follows a deductive approach. Having shown some particularities of OSSOs, we examine whether corruption can also appear in OSSOs using results of the “BCG Hacker Survey” (Lakhani et al., 2002). We find that in absence of the profit motive, corruption can occur nonetheless. We show that certain programmers in OSSOs do have a motive to bribe their su-

periors as well as their potential clients. An analysis of microeconomic effects of organizational corruption then illustrates that, on the long run, negative effects of corruption are devastating. Hence, corruption should be combated ex-ante. After this, we explore how corruption can be fought effectively. For that, we take Lange`s (2008) corruption control circumplex and question which of Lange`s instruments are best suited to combat corruption in OSSOs by defining two criteria: 'ability to fight corruption ex-ante' and 'no negative effect on the motivation of the employees'. We find that only the intrinsic instruments have the ability to effectively fight corruption in OSSOs and, as a result, should be applied even if the intervening moderator 'culture' is difficult to assess.

Particularities of Open Source Software Organizations

OSSOs are software developing organizations with five particularities:

1. The software license allows free disposability and distribution of the software, free access to and free modification of the source code as well as free discharge of the software. It implies neutrality of technology, no constraints concerning the distribution with other software and no discrimination against persons or groups (Nadan, 2009; Brügge et al., 2004; Ralston, 2009; Achtenhagen et al., 2003).

2. OSSOs do not have any commercial objectives (Brügge et al., 2004). Hence, the produced software is available for “zero price” (Stallmann, 2009:32).

3. Open Source Software is produced by collaborators who work in the organization on a free basis (Brügge et al., 2004) and, as a result, who are not paid for their work (Brügge et al., 2004).

4. There is a high degree of collaboration during the software development process (Brügge et al., 2004).

5. The software developers are locally dispersed (Brügge et al., 2004).

In particular, aspects 1, 2 and 3 show that OSSOs are different from ordinary organizations. In summary, it can be said that employees in OSSOs work on a voluntary basis, do not get any salary and the produced good is made available for free (zu Knyphausen-Aufseß, 2004). As a result of this, the neoclassical theory, according to which enterprises seek maximum profit and turnover, seems to be, at least partially, invalid in this case. Also the economical view that any labour needs an incentive seems not to be secured. Aspect 4 (high degree of collaboration) and aspect 5 (developers are locally dispersed) are not relevant for our future analysis of the relevance of corruption in OSSOs.

Analysing the relevance of corruption in Open Source Software Organizations – a traditional view

Having shown that the particularities of OSSOs make accepted economic principles seem invalid, we are now going to analyse, whether corruption can play a role in these types of organizations. For this purpose, we start with a traditional, pragmatic view, meaning that we compare the motives for organizational corruption with the characteristics of OSSOs. Organizational corruption is defined here as the misuse of organizational power for private and collective gain.[1] Possible forms of organizational corruption are (Pinto et al., 2008):

- Theft;

- Bribery;

- Wrong documentation of working time;
- Nepotism;
- Embezzlement;
- Collusive prizing;
- Sale of insecure products.

These forms can be clustered into the two types “Corrupt Organizations (CO)” and “Organizations of Corrupt Individuals (OCI)”. Pinto et al. (2008) define OCI as an organization in which a significant proportion of an organization’s members act in a corrupt manner primarily for their own benefit (e.g. theft or nepotism) whereas they define CO as an organization in which a group collectively acts in a corrupt manner for the benefit of the organization (e.g. collusive prizing or bribery).

Commercial motives are seen as being the primary reasons for corruption in literature (Pinto et al., 2008; Pfarrer et al., 2008). It is differentiated between external, internal-microeconomic and individual factors. Corruption researchers take the neoclassical theory as a basis and assume that enterprises are seeking for maximum profit or, at least, cost recovery and private households have the objective to maximize their utility. *External motives* which are created from the environment are for example the scarcity of resources or a difficult economic situation (Pinto et al., 2008). These external factors put organizations under financial pressure due to their profit motive for which reason a motivation for corruption is created. Organizations are supposed to be pushed to bribe their business partners so that they (the bribing organization) get the order and not their competitor. OSSOs, however, have no profit motive and make their produced goods (software) available for free (Brügge et al. 2004; Stallmann, 2009)

which makes the neoclassical theory at least partially be invalid. Hence, OSSOs are not put under financial pressure by external factors, e. g. scarcity of resources or the economic situation such as the financial crisis which means that, as figure 1 shows, external factors cannot be seen as motives for corruption in OSSOs.

Internal-microeconomic factors which are mentioned in the research literature are for instance the internal pressure for strong performance and good results in the organization, the pressure to create turnover and profit or the performance oriented remuneration (Pfarrer et al., 2008; Pinto et al., 2008). These factors are created by the organization itself. The microeconomic factor "performance-oriented remuneration" is supposed to produce indirect stimulation for corruption because employees have self-interest for the financial success of the organization in which they are employed. The better the performance of the organization, the higher is their remuneration. This can also be seen as a motive for corruption because employees acting for the organization can be motivated to bribe partners in order to get the contract (instead of their competitor) which would improve the turnover, profit, performance of the organization and, as a result, the remuneration of the employee. Due to the fact that employees do not get any salary for their work in the OSSO, this motive is not valid here. Hence, it cannot be seen as a corruption motive. Because of the absence of commercial motives, respectively profit motive, factors like pressure to create turnover, good financial results etc., which, for example, would have been a cause for bribery are not valid either (Vakhitov, 2004). In conclusion, as figure 1 shows, microeconomic factors represent no applicable motives for corruption in OSSOs.

Individual motives, such as individual financial targets of the employees may lead employees of organizations to corrupt actions (OCI) such as theft, bribery, eventually even to a wrong

documentation of their working hours since they would have financial benefits from this actions. However, due to the fact that work in OSSOs is voluntary these factors have to be considered as irrelevant. Hence, no commercial corruption motives can be identified. Figure 1 sums up corruption motives (external, internal, individual) and shows that these are irrelevant in OSSOs because of its particular characteristics.

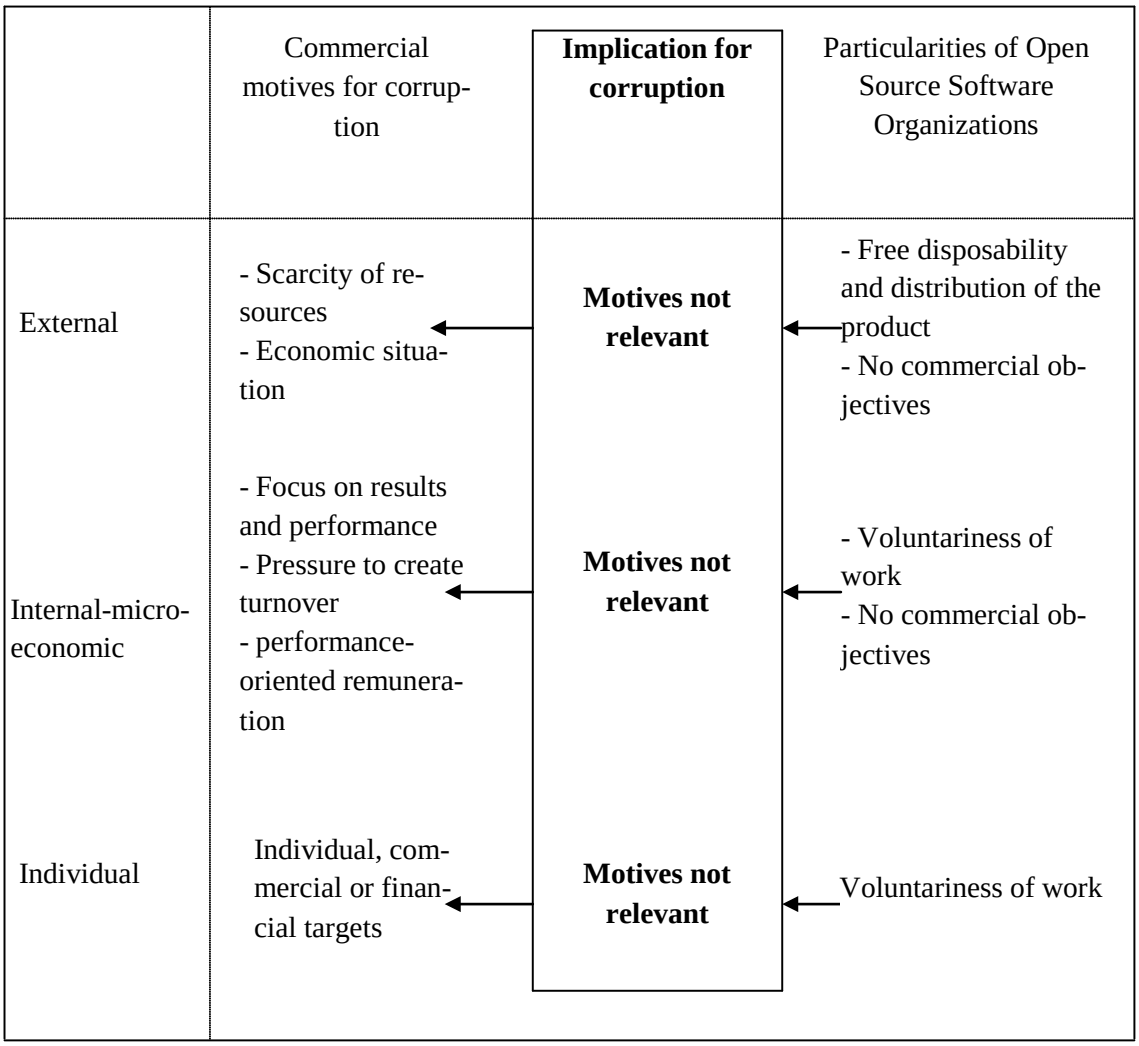

Figure 1 Commercial motives and corruption in Open Source Software Organizations.

Although no commercial corruption motives which are primarily seen as the reasons for corruption are expected to be found in OSSOs, it cannot be concluded that the presence of corruption in OSSOs is not possible. We argue that there may be non-commercial corruption motives which play a role in these organizations. To show this, we will analyse which types of programmers join the Open Source Software community. We are especially interested in their motivation structure, i.e. we want to investigate, why these people, who can be seen as the drivers of the open source development (Achtenhagen et al., 2003), join the Open Source Software Community. This will put us into the position to deflect potential corruption mo-

tives. For this, we now change the perspective and go from the organizational (OSSO) to the individual (programmer's) viewpoint.

Types of programmers in Open Source Software Organizations

In order to identify the causes for which programmers join the Open Source Software Community, we make use of the results of the "Boston Consulting Group Hacker Survey (Lakhani et al., 2002). In this empirical investigation, it was examined, what characteristics (e.g. education) software developers in OSSOs show, how an Open Source Project is organized and, what is crucial for our argumentation, *why the developers join an OSSO and work for it although they are not remunerated*. This investigation included two phases. In a first phase, 10 % of the software developers of "SourceForge" were randomly contacted by e-mail with a link to a web-based survey. 526 of the 1648 programmers responded which lead to a response rate of 34 %. In a second phase, 169 responses were received (30 % response rate). All in all, in this investigation 684 usable responses could be statistically evaluated. The question which is most relevant concerning our argumentation was: "What are your motivations to participate in an open-source-movement (multiple answers are possible)?"

The identified causes and motives for which programmers join the Open Source Software Community are shown in chart 1.

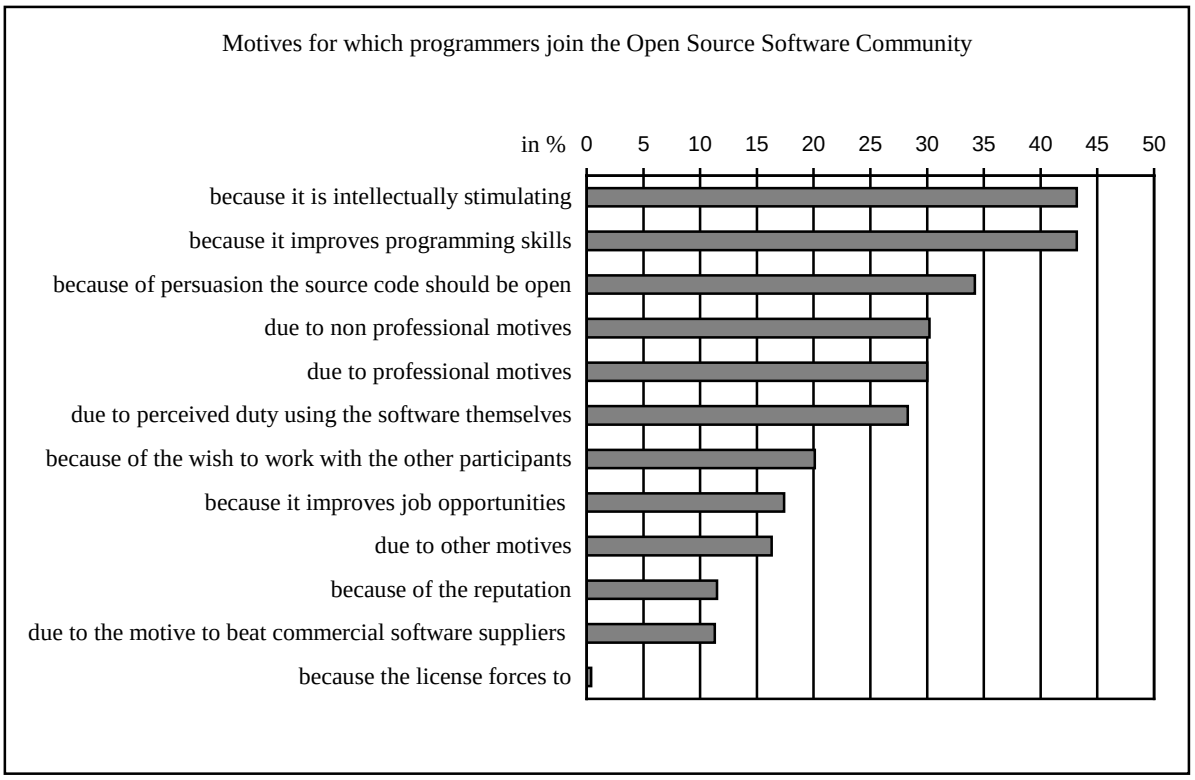

Chart 1 Motives for which programmers join the Open Source Software Community.

For our argumentation most important identified motives and respective answers were:

- 43.2 % because it is intellectually stimulating;
- 43.2 % because it improves programming skills;
- 34.2 % because of the persuasion, the source code should be open;
- 30.2 % due to non professional motives;
- 30.0 % due to professional motives;
- 20.1 % because of the wish to work with the other involved participants;
- 17.4 % because it improves job opportunities (can be mentioned in the CV);
- 11.5 % because of the reputation;

- 11.3 % due to the motive to beat commercial software suppliers (e.g. Microsoft).

On the basis of these results, four types of programmers (table 1) who join OSSOs were identified (Lakhani et al., 2002).

Believers (33 %) - 100 %: Conviction that the source code should be available for free - 38.1 %: Improvement of programming skills - 13.1 %: Beat commercial software suppliers (e. g. Microsoft)	**Skill Enhancers** (21 %) - 100 %: Improvement of programming skills - 46.9 %: Intellectual stimulation - 26.6 %: Status and reputation
Fun Seekers (25 %) - 88.0 %: Non professional causes (fun) - 75.9 %: Intellectual stimulation - 21.3 %: Wish to work in the Open Source Software team	**Professionals** (21 %) - 70.8 %: Professional causes - 45.5 %: Professional status - 34.9 %: Intellectual stimulation
Intrinsically motivated	***Extrinsically motivated***

Table 1 Types of people joining the Open Source Software Community (Lakhani et al., 2002).

These four types are grouped into extrinsically motivated[2] ("Skill Enhancers" and "Professionals") programmers which make up 42% of the group and intrinsically motivated[3] ("Believers" and "Fun Seekers") programmers with a share of 58%. The dominance of intrinsic

motives emphasizes the finding that in OSSOs no kind of work needs an incentive as it is assumed in the classical economic view.

Analysing the relevance of corruption in Open Source Software Organizations – a new approach

As table 1 shows, the programmers called "Fun Seekers" join OSSOs especially because of the fun motive (88.0 %) (Torvalds, 1998), the intellectual stimulation (75.0%) or their absolute wish to be part of the Open Source team (21.3%). They regard their work as a hobby and a useful pastime, which is confirmed by a statement like "As long as I can hack, I don't care what direction it goes." (Lakhani et al., 2002:20). As a result, there is no thought of competition which could lead to individual or collective pressure to success because market success is not a primary objective. Hence, it can be concluded that no motives for CO can be identified because "Fun Seekers" work for the sake of programming and are fully intrinsically motivated. They have no interest in bribing commercial partners in order to raise turnover. Moreover Fun Seekers have no motive for OCI because the place where they have fun is the OSSO. By being involved in OCI-practices, this would cause harm to their "fun-supplier" – the OSSO, which is not requested by "Fun Seekers".

"Professionals" have, above all, the objective to improve their professional skills (70.8 %) which puts them into the position to improve their career in the company where they are employed and where they work for remuneration (Hann et al., 2002; Shah, 2006). Furthermore, 34.9 % work in OSSOs for intellectual stimulation (Lakhani et al., 2002) and pursue the intention to assure a high quality of the projects which can be confirmed by the statement of a programmer from London: "The more professional quality in scope and documentation that get

released, the more interest people will have in contribution to future projects." (Lakhani et al., 2002:18). Also "Professionals" have no motive for corruption because, akin to "Fun Seekers", they do not have any market orientation and do not have the primary objective to achieve strong financial results. They see the OSSO as an opportunity to raise their human capital by improving their programming skills which will in return boost their reputation in the company that pays their salary (Lakhani, 2002). "Professionals" have no pressure to success and consequently no motive for CO can be detected. Furthermore, the phenomenon OCI is also very unlikely because when possible corrupt behaviour is detected, programmers will have to leave the OSSO which is to the detriment of their training opportunities. Hence, it can be said that "Professionals" have a strong incentive to neglect corrupt activities which may serve the individual but derogates the OSSO. In summary, no corruption motives could be found.

The extrinsically motivated "Skill Enhancers" join OSSOs in the first instance to improve their programming skills (100 %). At first glance, one cannot identify any corruption motives for "Skill Enhancers" because their primary motive to participate in OSSOs is the same as for "Professionals". However, 26.6 % join OSSOs on status or reputation grounds. Achtenhagen et al. (2003) as well as Shah (2006) focus on status and reputation motives within the organization itself while Bonaccorsi and Rossi (2006) mention the reputation among customers and consumers and Belenzon and Schankermann (2008) see primarily the commercial reputation and peer reputation as motives. As a result, reputation in OSSOs, especially peer reputation, plays an important role for participating in Open Source projects. If due to the very hierarchical organization in OSSOs (Achtenhagen et al., 2003) one assumes that the higher one's position in the OSSO, the higher his / her peer reputation, then we state that there may very well be corruption motives. We argue that "Skill Enhancers" may feel an incentive to bribe their

superior in order to get promoted earlier than colleagues which would mean a raise in their reputation due to their risen hierarchical position. This would represent a corrupt practice in terms of OCI (Pinto et al., 2008). It would have positive consequences for the individual, but negative consequences for the OSSO because superiors do not decide about promotion on the basis of merit, but are influenced by paid bribes. Hence, not the best suited people are in the respective positions, but a second-best solution is achieved. As a result, "Skill Enhancers" do have incentives for corruption and if they participate in Open Source projects, corruption can occur.

Intrinsically motivated "Believers" join OSSOs based on their belief that the source code should be open (100 %). They hold the view that "the community will get stronger and stronger thanks to what it is promoting: freedom" (Lakhani et al., 2002:19). However, 13.1 % of the "Believers" pursuit the ambition to beat established, commercial software suppliers, e.g. Microsoft (Achtenhagen et al., 2003). The motive to beat established software suppliers shows that types of programmers who are classified as "Believers" have a comparable attitude towards their work in OSSOs as employees in For-Profit Organizations have. They also have the primary objectives to beat competitors which make them have a market- or competition-orientation. Even if there are no commercial targets in OSSOs, the objective to achieve better results than rival, in our case established, commercial software suppliers, makes the intention go into the same direction as in For Profit Organizations because in both cases, the target is to dispose of more products (software) than the competitor. If one comes from Ashforth et al.'s (2008) argumentation that For Profit Organizations have motives for corruption, especially for the type CO because they may feel the incentive to bribe business partners in order to get the contract, then we argue that mutatis mutandis "Believers" in OSSOs do also have motives for

CO, e.g. bribery because their motive goes into the same direction as in For Profit Organizations. For example, it would be in their interest to bribe potential clients to make them chose the open source product instead of the commercial one, e.g. by offering special individual software-versions or free training-courses. As a result, we find that "Believers" may show motives for corruption, too.

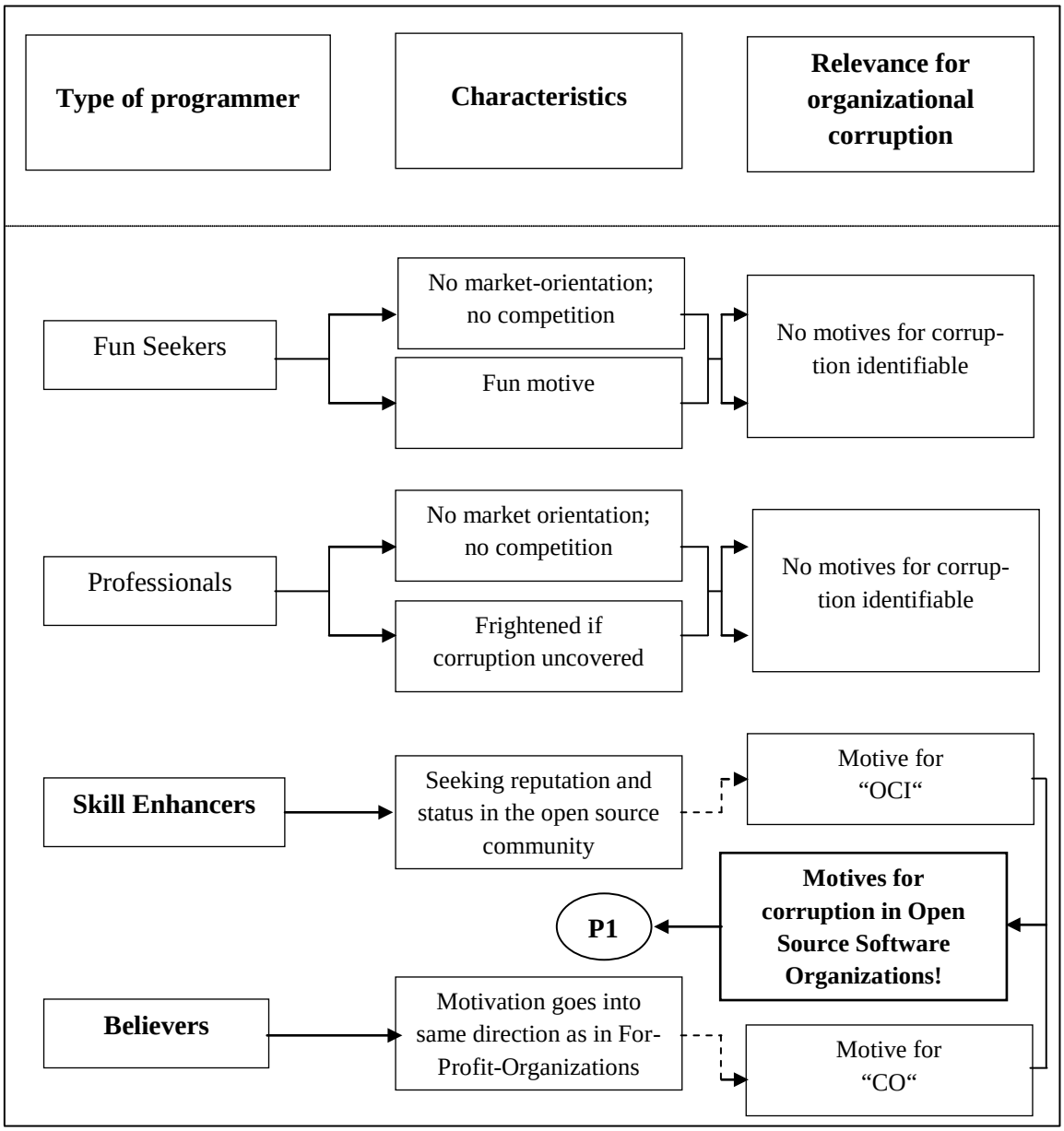

Figure 2 Relevance of corruption in Open Source Software Organizations – an individual perspective.

Our argumentation which is summarized in figure 2 leads us to our first proposition:

> *P1: If "Believers" or "Skill Enhancers" participate in Open Source Software Organizations, corruption is more likely to appear.*

Having shown that corruption thoroughly can play a role in OSSOs, we now have to investigate how corruption in OSSOs should be dealt with. While from an organizational perspective, OCI cannot have any positive effects, because the only beneficiary is the corrupting individual, the effects of the phenomenon CO have to be beheld in a differentiated way. On the short run, organizational corruption effects may be positive e.g. by created market entry barriers (Broadman, 2000), the negative effects on the long run are, however, devastating (Lange, 2008), e.g. negative reputation and negative performance. Taking a stakeholder view,[4] we consider the long-term effects of course as more important. Because of this, we argue that corruption has to be combated in OSSOs.

Instruments of organizational corruption control

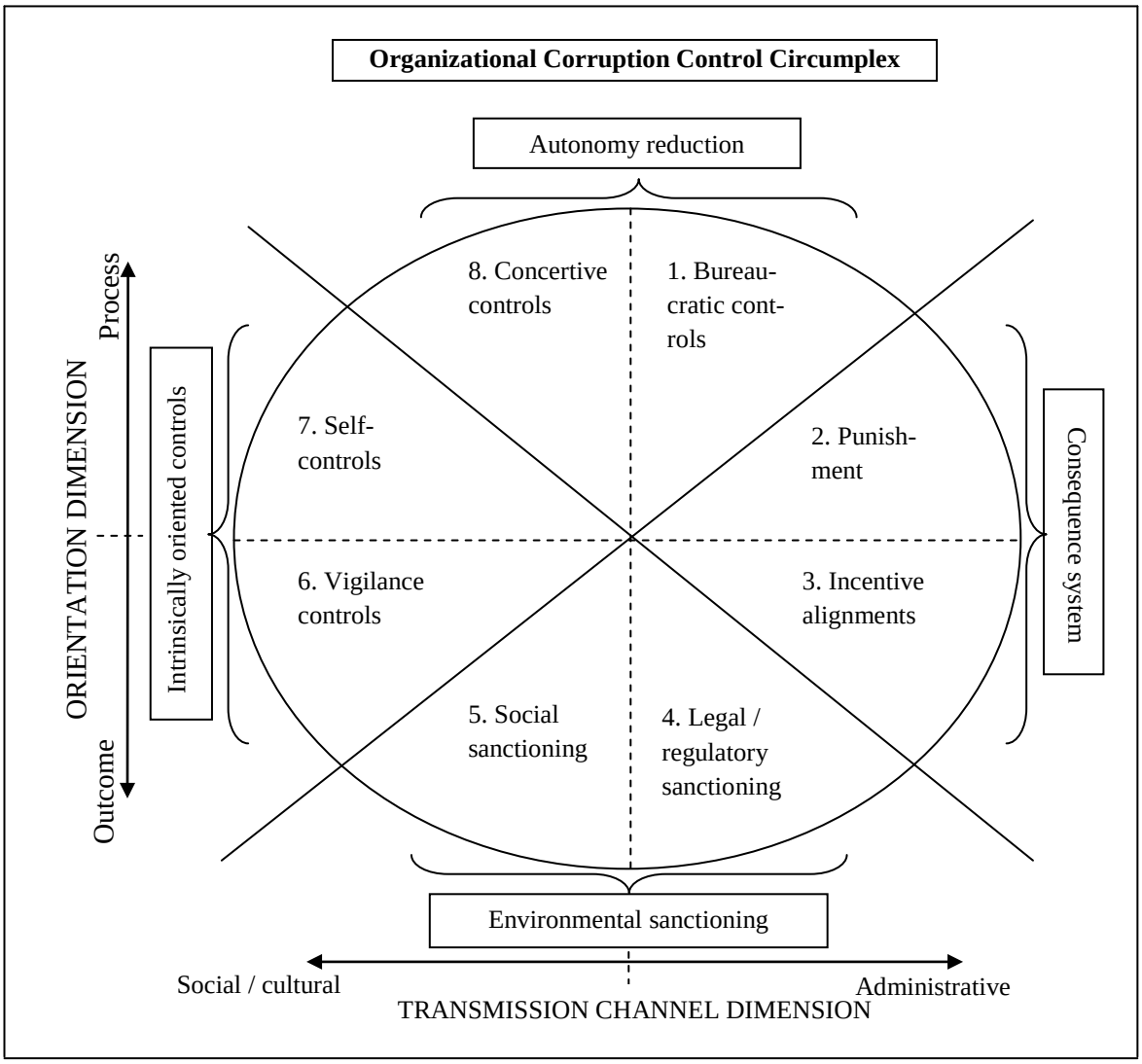

Figure 3 Organizational Corruption Control Circumplex (Lange, 2008).

Instruments for organizational corruption control are multiple. In his review, Lange (2008) classified these instruments in a circumplex (figure 3) with three dimensions:

1. Orientation dimension
2. Transmission channel dimension
3. Operation mode.

In the first dimension (orientation), Lange classifies the instruments by whether they set in at the corruption process or at the outcome. By this the circumplex (figure 3) is horizontally divided into two halves. The second dimension (transmission channel) divides figure 3 vertically and gives information what (transmission) ways the instruments take. In this aspect, Lange distinguishes between social / cultural and administrative transmission channels. Finally, the instruments are divided into four quadrants. This third dimension gives information about how the instruments operate i.e. autonomy reduction, consequence systems, environmental sanctioning and intrinsically orientated controls.[5] Out of these three dimensions, eight corruption control instruments emerge:

1. *Bureaucratic controls* which aim to fight corruption through standardized work processes e.g. formalized rules or centralized structures.

2. *Punishment,* e.g. suspension of an employee who was convicted of corruption. It is assumed that employees will learn from the consequences of their actions and, as a result, forbear corrupt activities in the future (theory of deterrence).

3. *Incentive alignments,* e.g. stock-option-plans, which create an external incentive (for extrinsically motivated) to omit corruption.

4. *Legal / regulatory sanctioning,* e.g. imprisonment or penalty, where, under theory of deterrence, employees are dissuaded from engaging in corrupt acts.

5. *Social sanctioning,* e.g. negative press which operate similarly as legal / sanctioning.

6. *Vigilance controls,* e.g. whistle blowing, which assume intrinsic motivation and extinguish that the employees will control each other on their own.

7. *Self-controls*, which, similar to vigilance controls, are voluntary at the level of individual motivation. It is assumed that the employees` objectives are congruent with those of the organization. As a result, avoiding and combating corruption creates satisfaction among the employees.

8. *Concertive controls* entail horizontal surveillance. Co workers actively monitor established and accepted behavioural norms – violations are sanctioned.

Combating corruption in Open Source Software Organizations – criteria of efficiency

To be able to assign which of Lange's instruments are best suited to combat corruption in OSSOs, we first have to define criteria of efficiency. We argue that not only corruption has to be combated in OSSOs but it has to be prohibited ex-ante because, as Misangyi et al. (2008) showed, it is very difficult to rebuild and reintegrate an organization which was once corrupt. Pfarrer et al. (2008) mention four phases which the organization has to pass through sequentially to be successfully reintegrated which means that it takes very long. In addition, there are moderators like the heterogeneity of the stakeholders or the prominence of the organization which hinder the re-socialization process and cannot be easily foreseen. As a result, combating ex-post is surely more difficult and less secure than anticipating corruption for which reason, OSSOs should forbid corruption before it even occurs. Hence, the first criterion of efficiency for corruption control instruments is the ability to prohibit corruption ex-ante.

Furthermore, as the particularities of OSSOs show, programmers are not remunerated for their work (Brügge et al., 2004; Vakhitov, 2004) but have other motives for their participation in open source where they program during their free time (Achtenhagen et al., 2003). Hence, it

would be fatal if the existing motivation of these voluntarily and unpaid working software developers was affected. For this reason, we designate as second criterion of efficiency that anti-corruption instruments must not influence the programmers' motivation in a negative way which, as a direct consequence of their decreased readiness to act, would harm the success of the OSSO.

To find out, which instruments are able to fulfil the two criteria of efficiency, especially which instruments do not affect the programmers' motivation, a further intermediate step is required. *We first have to identify the motivation structure of the OSSO-programmers which will then put us in the position to assign the effects of the instruments on the software developers' motivation.* To achieve this, we will transfuse the types of programmers joining the Open Source community on Frey / Osterloh's (2000) motivation types by comparing the crucial characteristics.

Types of motivation according to Frey / Osterloh in Open Source Software Organizations

Frey and Osterloh distinguish between five types of motivation which, due to explication and clarification motives, all represent ideal types. Hence, they only concentrate on one single objective. Whereas "Income maximizers" and "Status oriented" primarily react on extrinsic stimuli and, as a result, are extrinsically motivated, "Loyals", "Formalists" and "Self determinated" are intrinsically motivated.

The "Income maximizer" is consistent with the classical idea of man according to the economic theory. He is supposed to be "homo oeconomicus" and balances all decisions on a rational basis (rational choice approach). He considers work as displeasing and is only inter-

ested in its outcome – the remuneration. As a result, the "Income maximizer" will only be willing to raise his work input, if he gets a higher reward for it (Frey & Osterloh, 2000). "Status oriented" represent the second type of extrinsically motivated. They are interested in what others think about them and derive advantage from the comparison with other persons, e.g. with colleagues. What counts for them is their relative position, their relative status. This highly competitive type can especially be found in organizations in which title, status and position play an important role (Frey & Osterloh, 2000).

On the contrary, intrinsically motivated are not motivated by stimuli coming from outside. The objectives of "Loyals" are supposed to be congruent to those of the organization they are working for. They fully identify with the targets and the culture of the organization and, as a result, show a high commitment. "Formalists" have internalized the procedures which are supposed to be right and appropriate in the organization (Frey & Osterloh, 2000). This type is more oriented towards the process than towards the result and is motivated by applying the codified routines. "Self determinated" represent the last type of motivation. They do not care about others and are not influenced by external stimuli but concentrate on own, immaterial objectives, strive to employ the instruments they assess as appropriate and want to be free in the execution of their work. Examples for "Self determinated" are scientists or artists who solely follow their own ideology (Frey & Osterloh, 2000).

Which of these types of motivation can be found in OSSOs has to be determined by comparing the key characteristics, motives and objectives of the types of programmers according to the findings of the BCG Hacker Survey with those of Frey and Osterloh's types of motivation. This will put us into the position to transfuse the types of programmers on motivation types and finally *analyse the effect of Lange's (2008) corruption control instruments on the pro-*

grammers' motivation. We will not reduce our analysis to "Believers" and "Skill Enhancers", even if it was previously shown that only these two types show corruption motives because if corruption control instruments are applied, all programmers in OSSOs are concerned, not only those showing motives for corruption.

Extrinsically motivated "Skill Enhancers" pursuit the objective to ameliorate their programming skills and augment their reputation by joining OSSOs (Achtenhagen et al., 2003; Shah, 2006). In the end, "Skill Enhancers" have the target to increase their reputation within the OSSO (Belenzon & Schankermann, 2008) in order to achieve a higher status (Lakhani et al., 2002). Exactly these factors, which are achieving positive appraisals by others and the opportunity to raise reputation and status, motivate "Status oriented" at work (Frey & Osterloh, 2000). For "Professionals", a similar argumentation can be applied. They do not seek reputation within the OSSO but have the objective to improve their professional reputation which makes them also seem "status oriented" because they care about what others think about them. Due to the fact that motives and intentions of "Skill Enhancers" and "Professionals" comply with those of "Status oriented", we come to the following proposition:

> *P2a: In Open Source Software Organizations, "Skill Enhancers" and "Professionals" can be attributed to the type of motivation "Status oriented".*

"Believers" are persuaded that the source code should be open. Yet, they do also pursuit the objective to beat established commercial software suppliers, e.g. Microsoft (Achtenhagen et al., 2003). This strong intrinsic motivation combined with their high commitment (Lakhani et al., 2002) shows a strong conformity with the "Loyal's" objectives and motives according to Frey / Osterloh. Their individual aims and objectives are congruent with those of the organization (Frey & Osterloh, 2000) which means that they do also show high commitment and

intrinsic motivation. "Fun Seekers" are also intrinsically motivated and show a hight commitment because they have the request to work in the Open Source team (Lahkani et al., 2002) and want to avoid harm to the OSSO. This deductions leads us to our following proposition:

P2b: In Open Source Software Organizations, "Believers" and "Fun Seekers" can be attributed to the type of motivation "Loyals".

Figure 4 summarizes our previous argumentation.

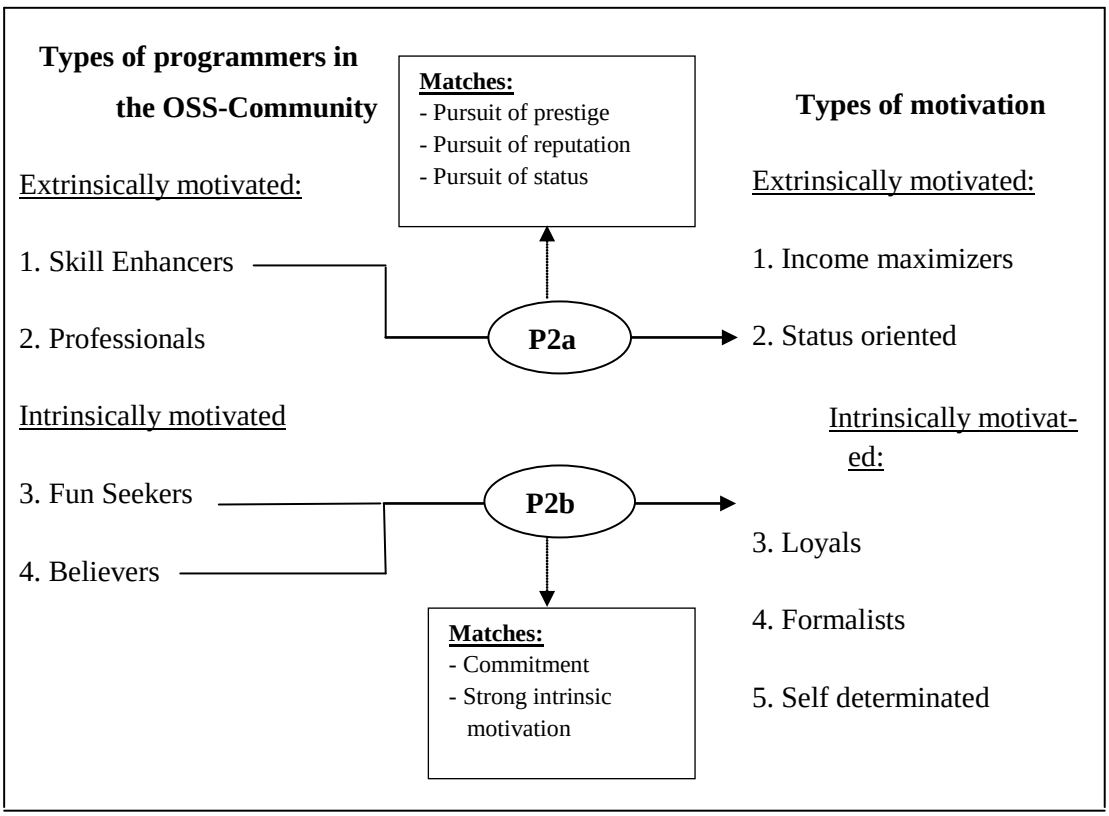

Figure 4 Transfusion of types of programmers on the types of motivation.

What remains is that for our following efficiency analysis of Lange's corruption control instruments, especially for the examination of the motivation effects, the two types of motivation according to Frey / Osterloh "Status oriented" and "Loyals" are relevant.

Figure 5 shows our following approach. We will analyse all of Lange's corruption control instruments on the basis of our defined criteria of efficiency for the relevant types of motivation which will then enable us to formulate recommendations for the management of OSSOs and our research result according to Whetten's criteria "what, how, why" (Whetten, 1989:490-492).

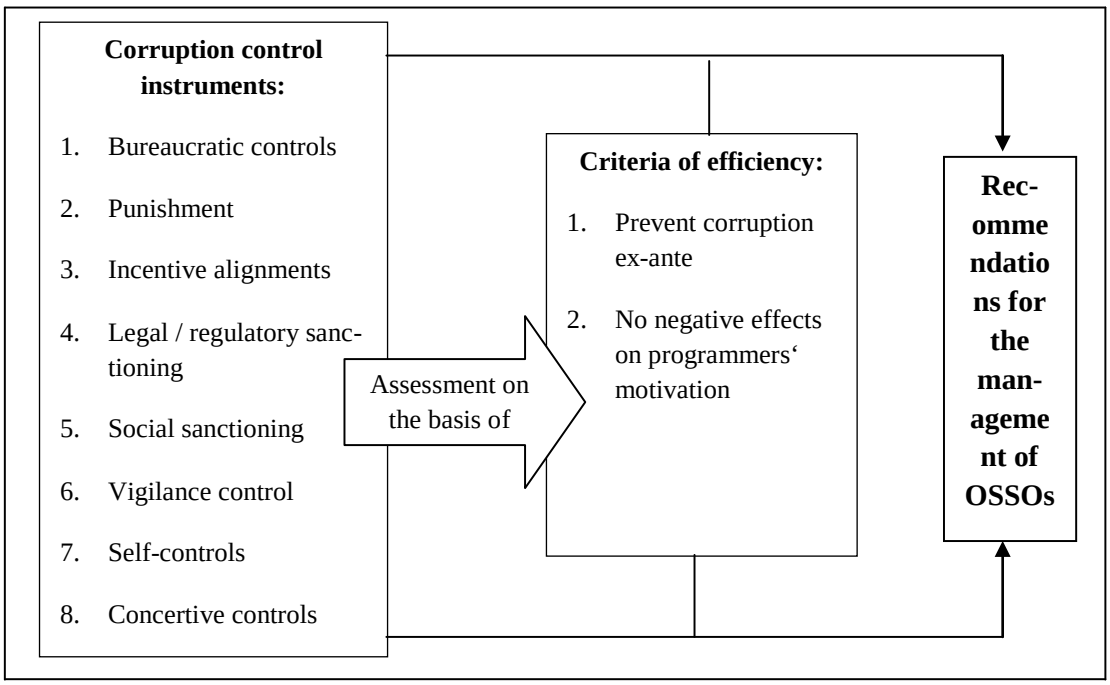

Figure 5 Assessment of Lange's corruption control instruments.

Efficiency analysis of corruption control instruments in Open Source Software Organizations

First of all, we analyse Lange's autonomy reducing instruments which are bureaucratic controls and concertive controls. It is assumed that individual liberties create opportunities and allow oneself room for corrupt practices which can be avoided by reducing this autonomy

(Lange, 2008). Bureaucratic controls include for example standardized work processes through formal rules, whereas concertive controls imply arrangements among the members of the organization to which all of them have to stick. An analysis of these instruments on the basis of our two criteria of efficiency clearly shows that these instruments are not suited for an adoption in OSSOs. Indeed, they provide the opportunity to prevent corruption ex-ante because reduced autonomy does not allow the emergence of any corrupt activity at all and, as a result, functions pre-emptively. However, we argue that "Status oriented" will be affected in their motivation because they consider the reduction of their autonomy as reduction of their status which is supposed to be their motivation driver. This will have negative effects on the performance of the OSSO. "Loyals" are likely to be affected in their motivation, too, because they identify themselves with the objectives of the OSSO. By applying autonomy reducing instruments, "Loyals" may be struck that the organization does not trust them so that it feels a need for control which is likely to lead to frustration and, as a result, negative motivation.

Lange's system of consequences which are our second analysed instruments tend to cause ethically correct behaviour and, as a result, to reject corrupt practices by the use of stimuli. It includes negative consequences, e.g. punishment by dislocation of the corrupter to an unattractive workplace as well as positive consequences, e.g. incentives by means of stock options (Lange, 2008). We argue that both instruments are capable of combating corruption ex-ante. Due to the programmers' fear of being punished, it can be argued via deterrence theory that these software developers will a priori avoid corrupt practices. Incentives to reject corruption also take effect already before the corrupt practice happens because the recompense is a result of not having acted in a corrupt way. Thus, the rewarding consequence emerges from the non-corrupt behaviour, the incentive is given before. As a result, corruption is supposed never to

appear. However, we argue that “Loyals” are likely to interpret the use of stimuli as lack of confidence on the part of the OSSO which, similar to autonomy reducing instruments, provokes frustration and affects their motivation. Positive stimuli, e.g. incentive alignments, are likely to have positive effects on “Status oriented” because they may feel confirmed in their position which is their motivation driver. However, we argue that negative stimuli will have a contrary effect because punishments damage reputation and status and thus provoke negative effects on work motivation. Due to the fact that no instrument of Lange’s consequence system has the ability to fulfil both criteria of efficiency for “Status oriented” as well as for “Loyals”, we argue that these instruments are not suited for an efficient adoption in OSSOs either. However, management of OSSOs should be aware of the fact that positive stimuli can be qualified to effectively combat corruption if they are applied for “Status oriented”. An application for “Loyals” should be avoided due to the negative motivation effects, why, in conclusion, these instruments should be handled with care in OSSOs.

Lange’s environmental sanctions include legal / regulatory sanctioning, e.g. imprisonment and social sanctioning, e.g. negative press (Lange, 2008). We are aware of the fact that these instruments cannot be directly applied by OSSOs but only by the responsible institutions. Hence, one might be prone to say that these instruments do not play any role and should not be analysed. However, we state that OSSOs do very well have an influence concerning the application of these instruments because they have the strategic choice to report uncovered corrupt practices to the cognizant institutions or not. As a result, reporting would be equivalent to applying the instruments, not reporting the contrary. These instruments are able to combat corruption ex-ante. We argue via deterrence theory and state that programmers will be afraid to corrupt due to possible environmental sanctioning and, as a result, corruption can be

avoided. However, it can clearly be shown that these instruments affect motivation of "Loyals" and "Status oriented". "Loyals" perceive a lack of trust which leads to frustration, whereas "Status oriented" feel pressure due to possible sanctions which makes them feel attacked in their status. As a result, environmental sanctions are not suited to be applied in OSSOs, i.e. OSSOs should not report uncovered corruption to the relevant institutions.

Lange's intrinsically oriented control instruments are the last to be analysed concerning their ability to fight corruption in OSSOs effectively. These instruments include vigilance controls and self controls (Lange, 2008).Vigilance controls mean that employees control each other in the organization and when the initiation of a corrupt practice can be detected, they intervene immediately. Self controls imply a high faith in the employees. It is assumed that employees will condemn corruption themselves and, as a result, will behave ethically correct which, in return, creates satisfaction because their personal objectives are congruent with those of the organization. Both instruments are apt to combat corruption ex-ante. Because of vigilance control instruments, attentive programmers immediately nip eventually emerging corruption intentions of their colleagues in the bud. Self control leads software developers to detect own potential corruption intentions themselves and to reject these immediately because own corrupt activities would create dissatisfaction. Moreover, we find at this point that these intrinsically oriented control instruments also arouse positive work motivation effects, for "Loyals" as well as for "Status oriented". Due to the fact that through peer control, vigilance control involves programmers in the anti-corruption fight and self control is based on individual autocontrol, "Loyals" perceive showed trust and valuation by the OSSO due to the autonomy which creates satisfaction and work motivation. "Status oriented" do not suffer under perceived status or reputation damage due to external control and punishment. Their liberty com-

bined with the fact of being involved in for the organization important corruption control confirms them in their status and, as a result, improves their work motivation. Consequently, intrinsically oriented control instruments meet both criteria of efficiency for “Loyals” as well as for “Status oriented” as table 2 shows. As a result, intrinsically oriented controls represent two efficient instruments to combat corruption in OSSOs which leads us to our last proposition:

> *P3: Only intrinsically oriented controls have the ability to effectively fight corruption in Open Source Software Organizations.*

As already mentioned, we found that incentive alignments do also have the ability to effectively fight corruption in OSSOs, but only for “Status oriented”, not for “Loyals”. We doubt that OSSOs know which type of motivation the different programmers in the respective OSSO belong to. Hence, we conclude and generalize that incentive alignments do not represent an effective alternative for corruption control in OSSOs.

Corruption control instruments	**Criteria of efficiency**			
	Ability to fight corruption ex-ante		No negative effects on pro-grammers'motivation	
	Loyals	Status oriented	Loyals	Status oriented
Autonomy reducing instru-ments:				
- Concertive controls	+	+	-	-
- Bureaucratic controls	+	+	-	-
Consequence system:				
- Punishment	+	+	-	-
- Incentive alignments	+	+	-	+
Environmental sanctioning:				
- Legal / regulatory	+	+	-	-
- Social	+	+	-	-
Intrinsically oriented con-trols:				
- Vigilance controls	+	+	+	+
- Self controls	+	+	+	+
	P3			

Table 2 Efficiency analysis of corruption control instruments.

Research result and Recommendations

Having analysed Lange's organizational corruption control instruments and having found that only intrinsically oriented control instruments are suited to fight corruption in OSSOs in an effective way (table 2), our research result under Whetten's criteria (1989) is the following:

> *If certain types of programmers work in an Open Source Software Organization, corruption can occur and should best be combated with the help of intrinsically oriented control instruments because they are able to avoid corruption ex-ante and at the same time do not affect the working motivation of the software developers.*

The resulting recommendations for management of OSSOs outreach the simple advice to make use of intrinsically oriented control instruments. Indeed we showed by dint of criteria of efficiency that these instruments are best suited to combat corruption for "Loyals" (Types of programmers: "Believers" and "Fun Seekers") and "Status oriented" (Types of programmers: "Skill Enhancers" and "Professionals"). However, we implicitly assumed that these instruments show an effect which is by no means assured because further characteristics, e.g. culture, play a role for this and have to be considered. Hence, when selecting programmers for the OSSO management should pay heed to select software developers who show an affinity for intrinsic instruments in order to assure their effect. It would, for instance, make sense to argue that selected software developers must have an ethically correct personality or that they have to identify with the objectives of the company. An investigation which personal characteristics are necessary to achieve a striking application of intrinsic instruments would surely be a meaningful undertaking.

Yet, we argue that the best and most effective way to avoid corruption is to hire exclusively programmers who do not show any corruption motives. It would for example make sense to focus on “Fun Seekers” and “Professionals” when recruiting developers. Thus, there would not even be a need to combat corruption in OSSOs, the question which instruments are best suited for fighting corruption would be redundant. We argue that the identification of the type of programmer is absolutely possible by asking the respective questions during an interview or by determining ones motivation in an assessment centre. The benefits would surely exceed the economic costs. However, we argue furthermore that motivation can change during time. Software developers which may once not have had any corruption motives now may have some. Because of this it is and will always be important to know which instruments can combat corruption effectively in OSSOs, even if at first glance no corruption motives appear.

Conclusion

In our article we analysed the organizational corruption phenomenon in OSSOs. The body-work was the following:

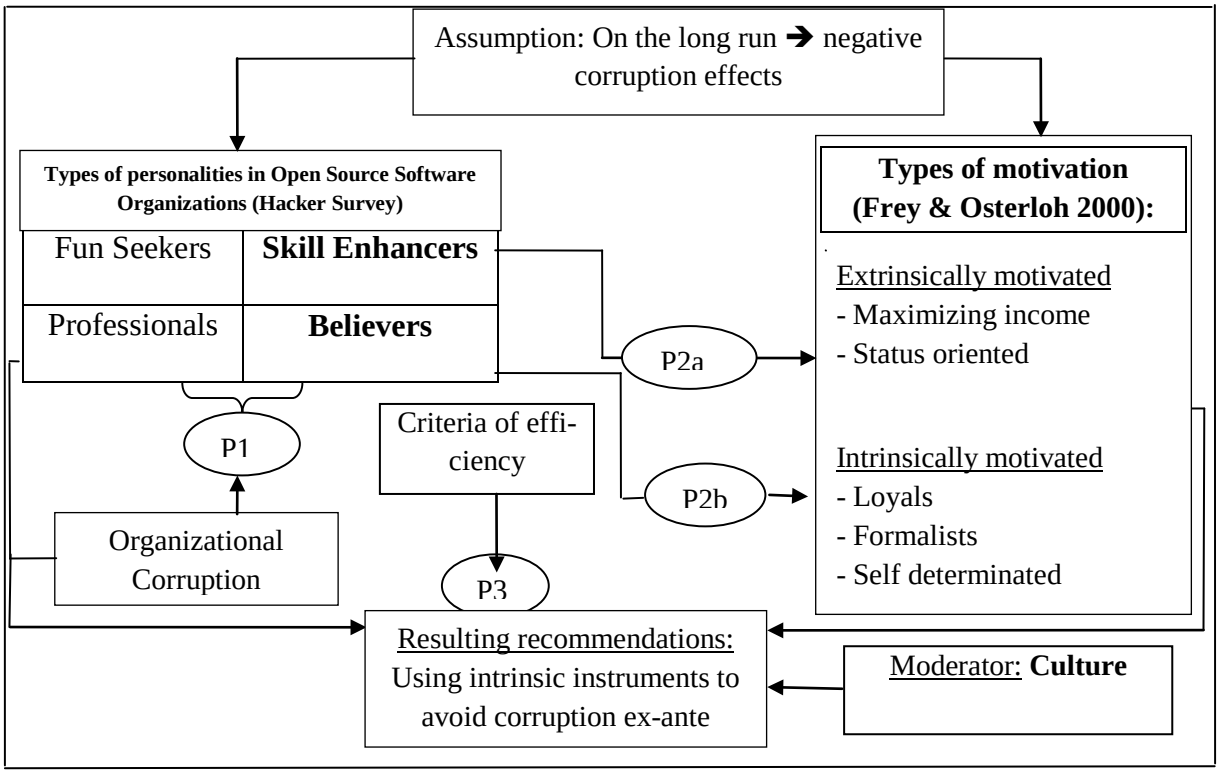

Figure 6 Bodywork of the article.

As figure 6 shows, we found that also in these organizations, in which there is no profit motive, corruption can occur nonetheless. To achieve this, we elicited the programmers' motives to join OSSOs using results of the BCG Hacker Survey and found that if "Believers" or "Skill Enhancers" participate in OSSOs, corruption is more likely to appear. Due to the fact that, on the long run, organizational corruption has very negative effects, we argued that corruption has to be combated. To find out which corruption control instruments are best suited to fight corruption in OSSOs, we first defined two criteria of efficiency which are the ability to fight corruption ex-ante and no negative effects on the programmers' motivation. In order to inves-

tigate which effects the instruments have on the motivation, we further had to get information on the motivation structure by transfusing the types of programmers of the BCG Hacker Survey on motivation types according to Frey and Osterloh (2000). We found that only intrinsically oriented corruption control instruments are able to combat corruption effectively in OSSOs.

As already mentioned in our previous section, we implicitly went from the fact that the intrinsically oriented instruments show an effect when they are applied. However, the effect of the instruments are influenced by an important moderator – the culture. It can be stated that intrinsically oriented instruments, especially vigilance controls, will have an effect to programmers of collective cultures (Hofstede, 2001), but it is at least questionable, if they will perform in individualistic cultures. Due to the fact that OSSOs are virtual organizations with programmers from all over the world, national cultures can not be clearly identified a priori. Consequently our recommendations may have qualified validity.

Moreover, we have to regard the relevance of our research project with the appropriate academic distance. Our analysis is purely theoretical. Although we were able to show that the corruption phenomenon may also occur in OSSOs applying a theoretical argumentation, corruption may not be a serious problem in practice. It is likely that OSSOs solely represent peripherally corrupt or thoroughly ethical organizations (Pinto et al., 2008). How distinct organizational corruption in OSSOs really is, still has to be empirically researched.

In a further research, it would be interesting to test our propositions empirically by applying qualitative research methods. To start with qualitative research before testing hypotheses is crucial because social processes and behaviours have to be understood. Finally, it would make sense to investigate, if our findings concerning OSSOs are transferable on other Open Source

models (e. g. Wikipedia) or if they are limited to the software sector. This would surely allow to generalize our recommendations and to accomplish the deductive approach.

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[1] We view the existing general corruption definitions as too broad. Our definition considers organizational corruption and includes Pintos two possible phenomenon: "Corrupt Organization" and "Organization of Corrupt Individuals" (Pinto et al., 2008).

[2] Intrinsic motivation means "[…] the doing of an activity for its inherent satisfaction rather than for some separable consequence" (Lakhani & Wolf, 2003:4)

[3] Extrinsic motivation "[…] pertains to a wide variety of behaviors that are engaged in as a means to an end and not for their own sake." (Alexandris et al., 2002:236)

[4] Of course there are no shareholders in OSSOs

[5] For further reading and more detailed information, please consider Lange, 2008.